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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
PATEL, SHAMBHAVI K	

ART UNIT	PAPER NUMBER
2128	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/743,086

Applicant(s)

YOSHIDA ET AL.

Examiner

Shambhavi Patel

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to the Amendment/Remarks submitted 02 February 2007.
2. Claims 1-20 are pending.

Response to Arguments

3. The 35 U.S.C. 112 rejection is withdrawn in view of Applicants' amendment.
4. Applicant's arguments filed 02 February 2007 have been fully considered but they are not persuasive.

Regarding the 35 U.S.C. 102 rejection:

i. Applicant submits:

In particular, according to Otter, the codes shown on page 152 are "an overall description of the system" and "a modelica model." The "modelica model" is a "hybrid model" having a "continuous plant" and a "digital controller." In other words, Otter simply shows a correspondence between the "equation description" and "hybrid model description" and not a relationship between the "hybrid model description" and "1st - 3rd programs." In

The equations in the created 1st-3rd programs (page 152) are based on the equations given on page 151. The equations on page 151 are a part of the hybrid model description:

A hybrid Modelica model basically consists of differential, algebraic and discrete equations. A typical example is given in figure 1 where a continuous plant

$$\dot{x}_p = f(x_p, u) \quad (2.1a)$$

$$y = g(x_p) \quad (2.1b)$$

is controlled by a digital linear controller

$$x_c(t_i) = Ax_c(t_i - T_s) + B(r(t_i) - y(t_i)) \quad (2.2a)$$

$$u(t_i) = Cx_c(t_i - T_s) + D(r(t_i) - y(t_i)) \quad (2.2b)$$

Thus, the Examiner maintains that a relationship exists between the "hybrid model description" and "1st-3rd programs".

Regarding the 35 U.S.C. 101 rejection:

ii. Applicant submits:

In response to the rejection under 35 U.S.C. § 101, Applicants refer to the first paragraph of the BRIEF SUMMARY OF THE INVENTION which states "the present invention is directed to a simulation method in a program product in which a mechanism system can easily and accurately be modeled using a hybrid model." Thus, it is respectfully submitted that the claims are directed to subject matter by which a hybrid model can easily and accurately be modeled, the modeled hybrid model clearly being a "useful, concrete and tangible result." Accordingly, it is respectfully submitted that the outstanding rejection under 35 U.S.C. § 101 is traversed. Reconsideration and withdrawal of this ground for rejection is respectfully requested.

The Examiner maintains that "a simulation method in a program product in which a mechanism can easily and accurately be modeled using a hybrid model" does not meet the 35 U.S.C. 101 requirements (i.e. a useful, concrete, and tangible result is not produced).

- iii. **Claims 1, 5, 9 and 12** are directed to generating programs, and claims 1 and 5 are further directed to executing these programs. However, if given its broadest, reasonable interpretation, merely generating and executing a program does not necessarily produce a useful, concrete, and tangible result.
- iv. **Claims 15 and 18** are directed to executing a continuous simulation. However, if given its broadest, reasonable interpretation, merely executing a continuous simulation does not necessarily produce a useful, concrete, and tangible result.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

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5. **Claims 1-20 are rejected under 35 U.S.C. 101** because the claimed invention is directed to non-statutory subject matter. The Examiner asserts that the current state of the claim language is such that a reasonable interpretation of the claims would not produce a useful, concrete or tangible result.

Regarding **claims 1 and 5**, executing a program to execute an additional process does not produce a tangible result. Regarding **claims 9 and 12**, generating a first, second, and third program does not produce a tangible result. Regarding **claims 15 and 18**, executing a continuous simulation does not produce a tangible result. All other claims are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1-20 are rejected under 35 U.S.C. 102(b)** as being clearly anticipated by **Otter** ('Hybrid Modeling in Modelica based on the Synchronous Data Flow Principle', 1999).

Regarding claims 1 and 5:

Otter discloses a simulation method of simulating a behavior of a mechanism to be simulated along a time axis on the basis of description data using a hybrid model, comprising:

- a. parsing the description data to extract a description of continuous system equations (**page 151: equations 2.1a-2.1b**), a description of switching of the continuous system equations upon state transition (**page 152: code in left hand column—'when' clause**), and a description of an additional process other than any process relating to the continuous system equations (**page 151: equations 2.2a**). The sampled data system includes a plant

(modeled using *continuous system equations*) and a controller (*additional process*). When the condition of the 'when' clause on page 152 becomes true (*switching activity*) an event is triggered, the integration is halted, and the equations within the when the when clause are active at this event instant.

- b. generating a first program on the basis of the extracted description of the continuous system equations (**page 152: code in left hand column—line 12**)
- c. generating a second program on the basis of the extracted description of the switching (**page 152: code in left hand column—lines 16-19**)
- d. generating a third program on the basis of the extracted description of the additional process (**page 152: code in left hand column—line 10**)
- e. converting, by executing the first program, data structures of the continuous system equations into other data structures that allow execution of a simulation (**page 152: code in left hand column**). The equations shown on page 151 of the prior art are converted to the data structures that allow execution of a simulation with the code shown on page 152.
- f. switching, by executing the second program, the converted continuous system equations to activate appropriate one of the converted continuous system equations and deactivate another instead, in response to occurrence of a first event (**page 152: last block of code in right hand column**). This is the code used to represent the switching activity. A specific example of this is given on **page 156 left hand column and figure 7**.
- g. executing the simulation (**page 156 left hand column last paragraph**) to output data that expresses the behavior of the mechanism, wherein the activated one of the continuous system equations is solved by numerical integration along the time axis according to the converted data structure ('**3 Relation Triggered Events**'). The simulation is done through Dymola by continuous integration.

- h. executing the third program to execute the additional process in response to occurrence of a second event (**page 152 2nd paragraph**). The simulation of the additional process is performed in zero (simulated) time, meaning that time is abstracted from the computations and communications.

Regarding claim 2 and 6:

Otter discloses the method according to claims 1 and 5, further comprising detecting an occurrence of an event; and calling the third program if the detected event corresponds to the second event (**page 152 left hand column 1st paragraph**). When an event is triggered and evaluated to *true*, the when clause is entered, and the digital controller is simulated.

Regarding claim 3 and 7:

Otter discloses the method according to claims 1 and 5, further comprising: exchanging a control signal with an external system through an input/output port (**figure 1 variables u, y**) in accordance with the third program, the external system including a mechanism control software system that control the mechanism (**figure 1 controller**).

Regarding claims 4 and 8:

Otter discloses the method according to claims 1 and 5, wherein the first event contains an evaluation result of internal variables of the mechanism (**page 152: code in left hand column—lines 16-19 sample (0, Ts)**). The code samples events at sample instants using T_s (*an internal variable*).

Regarding claims 9 and 12:

Otter discloses a method for analyzing a hybrid model which is used for a simulation of a behavior of a mechanism to be simulated along a time axis, the method comprising:

- a. parsing the hybrid model description to extract a first description associated with continuous system equations (**page 151: equations 2.1a-2.1b**), a second description associated with state transition (**page 152: code in left hand column—‘when’ clause**), and a third description associated with an additional process (**page 151: equations 2.2a**). The sampled data system includes a plant (modeled using *continuous system equations*) and a controller (*additional process*). When the condition of the ‘when’ clause on page 152 becomes true (*switching activity*) an event is triggered, the integration is halted, and the equations within the when the when clause are active at this event instant.
- b. generating a first program based on the first description (**page 152: code in left hand column—line 12**), a second program based on the second description (**page 152: code in left hand column—lines 16-19**), and a third program based on the third description (**page 152: code in left hand column—line 10**).

Regarding claims 10 and 13:

Otter discloses the method according to claims 9 and 12, wherein the third description comprises a first part which describes content of an additional process (**page 152: code in left hand column lines 17-18**), and a second part which describes an execution control of the additional process in response to occurrence of an event (**page 152: code in left hand column line 16**).

Regarding claims 11 and 14:

Otter discloses the method according to claims 10 and 13, wherein the generating further comprises: generating the third program on the basis of the first part of the third description (**page 152:**

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code in left hand column—line 10); and adding a program based on the second part to the second program (page 152: code in left hand column lines 16-18).

Regarding claims 15 and 18:

Otter discloses a simulation method for simulating a behavior of a mechanism along with a time axis, using a hybrid model including a continuous system model expressed by continuous system equations (page 151: equations 2.1a-2.1b), a state transition model expressing state transition upon occurrence of described events (page 152: code in left hand column—‘when’ clause), and an additional process model (page 151: equations 2.2a), the method comprising:

- a. storing the continuous system model in a storage (figure 1)
- b. checking whether any one of the events described in the state transition model is occurred and checking whether the occurred event is associated with the additional process model (page 152 left hand column 1st paragraph). The operator *sample(...)* triggers events at sample instants and depending on whether it returns true or false (*associated with additional process or not*), the when is clause is entered.
- c. executing an additional process corresponding to the additional process model if the occurred event is associated with the additional process model (page 152 code in left hand column lines 17-18)
- d. executing a continuous simulation on the basis of continuous system equations that are active among the continuous system model stored in the storage (‘3. Relation Triggered Events’). The continuous system equations are simulated through continuous integration.

Regarding claims 16 and 19:

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Otter discloses the method according to claims 15 and 18, wherein the executing the additional process comprises exchanging a control signal with an external system through an input/output port (**figure 1 variables u, y**), the external system including a mechanism control software system that control the mechanism (**figure 1 controller**).

Regarding claims 17 and 20:

Otter discloses the method according to claims 15 and 18, further comprising switching, in response to state transition based on the state transition model, the continuous system equations that are active (**page 152 left hand column 1st paragraph**).

Examiner's Remarks

Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

In the case of amending the claimed invention, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shambhavi Patel whose telephone number is (571) 272-5877. The examiner can normally be reached on Monday-Friday, 8:00 am – 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571) 272-2279. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SKP


KAMINI SHAH
SUPERVISORY PATENT EXAMINER

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